



Drilling Fluid Solutions / Lost Circulation Materials

HYDRO-GUARD® system and STEELSEAL® LCM bridging treatment help eliminate casing run in depleted zones

Location: Saudi Arabia

Overview

The operator needed to drill an 8 3/8-in. hole through the Khuff C carbonate formation and a 5 7/8-in. hole through the Jauf sandstone formation with high overbalances of 4,465 psi and 3,427 psi, respectively. Downhole temperatures could reach as high as 343°F (172 °C) Offset wells had encountered lost circulation, stuck liners, and hole instability due to reactive shale formations.

Halliburton's Solution

The Baroid team had four objectives:

- Provide bridging materials and bridging efficiency to increase the propagation fracture pressure of the formation
- Provide lubricity to reduce the friction coefficient
- Enhance the filtrate properties to minimize the risk of differential sticking possibilities
- Provide effective inhibition for the reactive clays and shales

The team performed lab testing to determine the optimal formulation for HYDRO-GUARD® high-performance water-based fluid, including CLAY GRABBER® shale stabilizer and clay encapsulator. Utilizing the WellSET treatment, sized STEELSEAL® resilient graphitic carbon lost circulation material (LCM) was also added to the system to help increase the fracture propagation pressure while drilling through the subpressured zones. The required STEELSEAL LCM additions were based on particle plugging test results. STEELSEAL 400 (5 ppb), STEELSEAL 100 (4 ppb), and STEELSEAL 50 (4 ppb) was added through the bottom hole assembly via RSS and MWD. The pill was pumped at 450 - 500 gpm with a density of ±15-20 pcf (2-3 ppg) higher than the mud drilling weight. The bottom hole temperature at the loss zone was 320-340° F/160-171° C.

After reaching the casing point for the 8-3/8” interval, the operator was able to continue drilling to well total depth, passing through the Jauf sandstones with a 3,951-psi overbalance. This eliminated the need for one string of casing and significantly reduced drilling time.

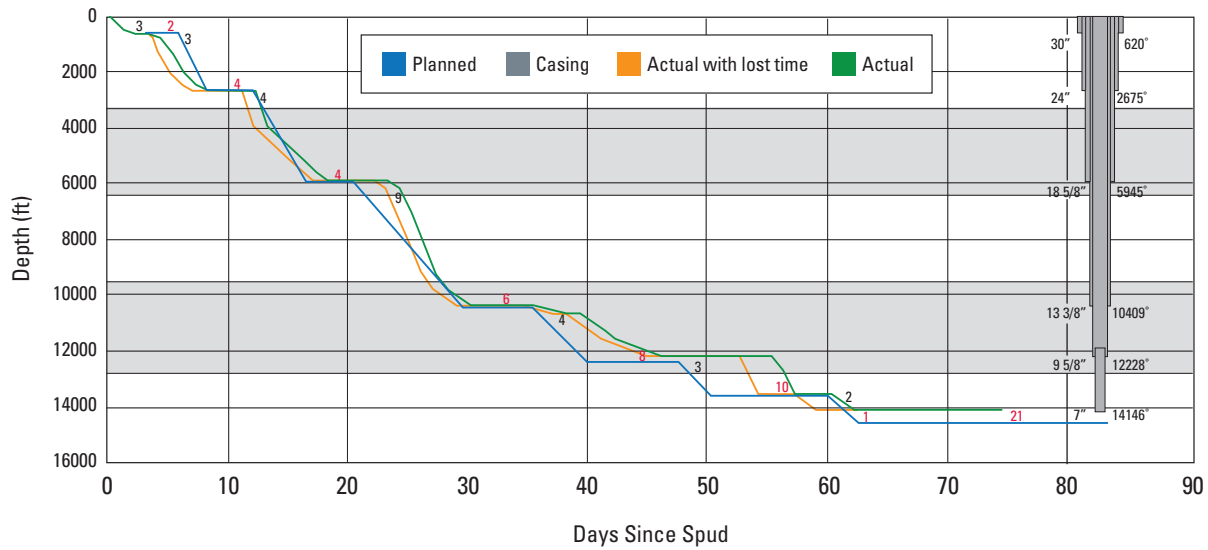
CHALLENGE	SOLUTION	RESULTS
Offset wells had encountered severe losses, shale instability, and stuck pipe in two adjacent sub-pressured zones.	High-performance HYDRO-GUARD® water-based fluid, treated with sized LCM, provided shale inhibition and effective bridging to prevent hole instability and lost circulation.	The 8 3/8-in. Khuff C carbonate interval and the 5 7/8-in. Jauf sandstone interval were combined in a continuous drilling operation, eliminating one casing run and with zero wellbore instability issues.

Economic Value Created

Successfully drilling, logging, and completing these two combined sections as a single interval saved costs and time in multiple ways. The combined interval was drilled three days faster than planned, and encountered none of the issues observed on offset wells. One casing run was eliminated. This calculates to an estimated US\$500,000 in savings, including rig-time, liner, and cementing costs.

The HYDRO-GUARD system provided excellent hole stability during extended periods of logging, enabling the operator to obtain a full set of logs for the whole interval and against the high overbalance zone.

The WellSET® treatment with sized STEELSEAL LCM formed an effective filter cake that minimized invasion into the producing formation.



Planned time was 83.4 days, and actual time was 75 days

